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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 911,098	07 23 2001	Kang-Wook Park	5649-S05DV	4775

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EXAMINER

FARAHANI, DANA

ART UNIT PAPER NUMBER

2814

DATE MAILED: 01/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/911,098

Applicant(s)

PARK, KANG-WOOK

Examiner

Dana Farahani

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on 08 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☐ Claim(s) 1-9, 27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-9, 27 and 28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 9, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Japanese Patent 06045342, issued to Kanamori, both previously cited.

Regarding claims 1 and 9, AAPA discloses in figure 1 A bipolar junction transistor (BJT) comprising an intrinsic collector region 13 of a first conductivity type in a semiconductor substrate 10; a trench 19 in the substrate, adjacent the intrinsic collector region; and an emitter region 41 of the first conductivity type that forms a P-N rectifying junction with the base region.

AAPA does not disclose a base electrode of a second conductivity type in a trench, and a base region of the second conductivity type that is self-aligned to the base electrode and forms a P-N rectifying junction with the intrinsic collector region.

The Japanese patent discloses in figure 3 a base region 3 of the second conductivity type and base electrode 5 forms a P-N rectifying junction with the collector region 1. Furthermore, the Japanese patent discloses that this structure reduces the resistance between base and emitter (see the paragraph below the abstract). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention

was made to use the base structure in the Japanese patent in AAPA in order to reduce the resistance between the base and emitter of AAPA.

Regarding claims 27 and 28, AAPA further discloses in figure 1 a first electrically insulating layer 25 and a second electrically insulating layer 37 on layer 25 having a lateral recess, as shown in the figure, that extends along an undersurface of the second insulating material, also disclosing openings 35 and 55 in the insulating layers.

3. Claims 2-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of the Japanese patent, as applied to claim 1 above, and further in view of Lee et al., hereinafter Lee (U.S. Patent 5,506,157).

Regarding claims 2 and 3, AAPA in view of the Japanese patent renders obvious the claimed invention, as discussed above, except for a trench-insulating layer disposed between the base electrode 5 and a sidewall of trench 5 of the Japanese patent.

Lee teaches in figure 4E a base electrode 24 surrounded by insulator 34 of figure 4D.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to dispose a trench insulating layer between the base electrode and the side wall of the trench 5 of the Japanese patent, as Lee teaches, in order to limit the bipolar junction transistor operation to the region on top of the trench. Also, by providing the trench insulator, the parasitic capacitance between the collector and base region, which is undesirable, will be significantly reduced.

Regarding claims 4 and 6, AAPA discloses in figure 2 base region comprises an extrinsic base region 42 in the extrinsic collector 13; and intrinsic base region 43 of

second conductivity type with lower doping than the extrinsic base region in the intrinsic collector region.

Regarding claim 5, AAPA discloses in figure 2 base electrode extension 23 that extends along the surface of the substrate, and emitter region 41 is self-aligned to a sidewall of the base electrode extension.

Regarding claim 7, AAPA discloses in figure 2 an electrically insulating sidewall spacer 29 on the side-wall of the base electrode extension, and an emitter electrode 31 of the first conductivity type on the surface of the substrate and on the electrically insulating side-wall spacer.

Regarding claim 8, AAPA discloses in figure 2 a buried extrinsic collector region 11 of the first conductivity type in the substrate.

### ***Response to Arguments***

4. Applicant's arguments filed 11/18/02 have been fully considered but they are not persuasive.

For clarification, the examiner is arguing that the Japanese patent discloses a base electrode in a trench.

Applicant mainly argues that graft base region 5 is formed by diffusing boron in to the substrate. Applicant concludes that since extrinsic base region 42 of AAPA is also formed by diffusing p-type dopants, the graft base region of the Japanese patent is essentially in AAPA. However, the examiner notes that what is claimed is a base electrode in a trench. Note that region 5 of the Japanese patent is heavily doped, and

aligned with the base electrode portions 4a, 4b, and 8. Therefore, regions 5 are essentially part of the base electrode due to the fact that they are heavily doped, and connect base region 3 to the upper portions of the base electrode. Furthermore, they are inside a trench, as can be seen in the figure. Now, the fact that regions 5 are formed by diffusion, or other preferred method, has nothing to do with their physical location and geometrical figure, which are the same as the limitations in claim 1, namely a base electrode in a trench.

### ***Conclusion***

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

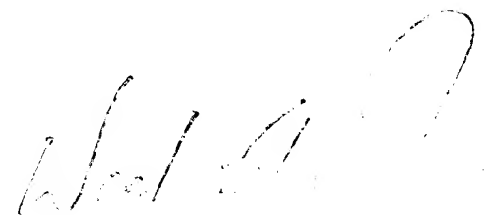
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dana Farahani whose telephone number is (703)305-1914. The examiner can normally be reached on M-F 8:00AM - 6:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703)308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9318 for regular communications and (703)872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Dana Farahani  
January 23, 2003

  
S. Wael Fahmy  
TECHNICAL STAFF